NON-PUBLIC?: N
ACCESSION #: 9307150058
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 1 PAGE: 1 OF 07

DOCKET NUMBER: 05000272

TITLE: Reactor Trip from 85% Power; 4 Circulating Water System
Circ. Pumps Tripped due to Debris.
EVENT DATE: 06/08/93 LER #: 93-011-00 REPORT DATE: 07/08/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M. J. Pastva, Jr. - LER Coordinator TELEPHONE: (609) 339-2215

COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On 6/8/93, at 1745 hours, an automatic reactor trip from 85% power occurred due to a Main Turbine trip from low condenser vacuum and P-9 trip permissive (i.e. reactor trip on turbine trip > 50% power). This occurred during diver cleaning of the unit Circulating Water System (CWS) trash racks. Prior to this event a turbine load reduction had been initiated and a subsequent order had been given, at 1744 hours, to manually trip the reactor in response to decreasing condenser vacuum. However, before the trip was initiated, the automatic reactor trip occurred. The vacuum decrease resulted from manual tripping of 13A CWS pump and automatic tripping of 12A, 11B, and 11A CWS pumps due to high differential pressure across the pumps' traveling screens. The unit was stabilized in MoDE 3 (Hot Standby). The root cause of this event is "Management/Quality Assurance Deficiency" with a contributing causal

factor of "External". specific contributing factors include trash rack

debris removal, maintenance of the trash rake which limited its ability to adequately clean the trash racks, and not implementing a past corrective action to modify the trash rake. Unit 1 CWS trash rack cleaning was completed prior to subsequent Unit startup. The circulating water intake structure was dredged. The CWS trash rack rake will be overhauled or replaced. The practice of using divers to clean CWS trash racks will be evaluated to help reduce risks associated with this type activity. Administrative controls will be developed and implemented, as appropriate, to address operation of the CWS trash racks' rake.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as {xx}

IDENTIFICATION OF OCCURRENCE:

Reactor Trip From 85% Power; 4 Circulating Water System Circulator Pumps Tripped Due To Debris Buildup

Event Date: 6/8/93

Report Date: 7/8/93

This report was initiated by Incident Report No. 93-268.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 100% - Unit Load 1130 MWe

12B Circulator was cleared and tagged for underwater hydrolazing of trash racks, which was initiated on June 8, 1993, at approximately 1700 hours.

DESCRIPTION OF OCCURRENCE:

On June 8, 1993, at 1745 hours, an automatic Reactor Trip occurred due to a Main Turbine Trip from low condenser vacuum and P-9 trip permissive.

At 1741 hours, condenser vacuum decreased when 13A circulating pump was manually tripped due to a 12-foot differential pressure across the circulator traveling screen. Immediately thereafter, 12A circulating pump automatically tripped due to traveling screen high differential pressure. At 1742 hours, 11B circulating pump automatically tripped and at 1743 hours, 11A circulating pump automatically tripped resulting in rapid decrease in main condenser vacuum. Following the loss of 13A and 12A pumps, a turbine load reduction was initiated in accordance with Abnormal operating Procedure, S1.OP-AB.CW-0001(Q), "Circulating Water System Malfunction". At 1744 hours a manual Reactor Trip was ordered due to continuing decrease in condenser vacuum. However, before the trip was initiated, the automatic Reactor trip occurred. At the time of the trip, Reactor power had been reduced to approximately 85%. The Unit was then stabilized in MODE 3 (Hot Standby). At 1748 hours, a manual Main Steamline Isolation was initiated, in accordance with Emergency Operating Procedure EOP-TRIP-2, due to excessive plant cooldown. The Nuclear Regulatory commission was notified of the

DESCRIPTION OF OCCURRENCE: (cont'd)

automatic actuation of the Reactor Protection System, in accordance with Code of Federal Regulations 10CFR50.72 (B) (2) (ii).

ANALYSIS OF OCCURRENCE:

The Circulating Water System (CWS) {NN} is designed to dissipate waste heat to the Delaware River. It takes suction from the river through a fixed trash rack and vertical traveling screens. The water is pumped, via vertical circulating pumps, into the Unit's main condenser.

Approximately forty (40) minutes before the reactor trip, divers began cleaning the 12B circulator trash rack to remove accumulated debris and river silt. The cleaning activity apparently dislodged debris in excess of the circulating traveling screens' removal capability and it quickly built up on the traveling screens. Power was reduced to approximately 85%. The traveling screen differential pressure trip setpoint was reached on several circulators resulting in the Unit trip on low condenser vacuum and the P-9 trip permissive (reactor trip on turbine trip above 50% power). This occurred as Control Room operators were about to manually trip the reactor. Prior to this event 11A, 11B, and 12A circulator trash racks had

been cleaned with no adverse effects.

The Reactor Protection System (RPS) {JC} and the MS10s (atmospheric reliefs) functioned as designed. Following the reactor trip, Main Steam Isolation was initiated due to excessive Reactor Coolant System cooldown. Reduction in T sub avg requiring main steamline isolation, has been experienced during other reactor trips (e.g., LER 272/93-004-00 and Unit 2 LER 311/93-002-00). The RPS system actuation and the initiation of Main Steamline Isolation are reportable in accordance with the Code of Federal Regulations 10CFR50.73 (a) (2) (iv).

Post-trip inspections of the CWS intake bay structure showed large mats of debris extending approximately 30 feet out from the structure at a depth of approximately twenty-five feet. Debris from the Unit 1 trash rack cleaning activity was removed by the traveling screens and the amount of differential pressure across the traveling screens decreased. The affected circulators on each Unit were then returned to service.

APPARENT CAUSE OF OCCURRENCE:

The root cause of this event is "Management/Quality Assurance Deficiency" (per NUREG-1022) with a contributing causal factor of "External".

In December 1992, inspections did not reveal excessive buildup of grasses or debris. Throughout the Spring of 1993 severe weather conditions resulted in greater than normal quantities of marsh grasses

APPARENT CAUSE OF OCCURRENCE: (cont'd)

and debris coming down river and affecting CWS operation. Several times, unit power has been reduced to mitigate the effect of the debris buildup on the CWS traveling screens and to allow traveling screen and main condenser waterbox cleaning. See Attachment 1 "Bathymetric Profiles In Front Of The Circulating Water Intakes - June 1993", which shows the extent of the debris (detritus) buildup prior to this event and following subsequent debris removal in June 1993!.

Specific factors to the cause of this event include debris removal by the diver, maintenance of the trash rake which limited its

ability to adequately clean the trash racks, and not implementing an outstanding corrective action to modify the trash rake (See Attachment 2 "Circulating Water Intake Cross Section").

Although extensive planning was conducted prior to initiation of rack cleaning, complications occurred that were not anticipated. As a result, divers cleaning the 12B circulator trash racks dislodged debris in excess of the circulating traveling screens removal capability. Debris buildup on the traveling screens quickly occurred and the traveling screen differential pressure trip setpoint of the circulating pumps was reached resulting in the trip of the Unit.

The rake only cleans the rack approximately 25-feet down from the CWS deck leaving the lower 25-foot half of the rack uncleaned and therefore susceptible to accelerated debris buildup. It could not be determined when the rake cable was reduced to its current length of travel.

In 1989, a similar event was reported in LER 311/89-013-00. A design modification to improve the reliability and performance of the trash rake, committed to in the 1989 LER, remains outstanding. Since 1989, administrative controls have been reviewed and enhanced to better control commitments. These controls include implementation in 1992 of Nuclear Department Administrative Procedure NC.NA-AP.ZZ-0030(Q), "Commitment Management".

PRIOR SIMILAR OCCURRENCES:

LER 311/89-013-00 addressed a similar reactor trip event which was also due to excess river debris and grasses causing high CWS differential pressure. The report identified that the trash rack rake was unable to clear the excessive amounts of river grass and debris. Long term corrective actions to the 1989 event included establishment of a preventive maintenance activity to clean the trash rack every refueling outage (18 months) and to modify the trash rake, to improve its reliability and performance. Completion of the modification to the trash rake remains outstanding.

SAFETY SIGNIFICANCE:

This event did not affect the health and safety of the public. The loss of circulating water to Unit 1 resulted in a turbine trip,

which is a Condition II fault of moderate frequency, addressed by Section 15.2.7 of the Updated Final Safety Analysis Report. The plant responded per design following the reactor trip except for the reduction in T sub avg as discussed previously.

CORRECTIVE ACTION:

Unit 1 circulator trash rack cleaning was completed prior to subsequent startup of the Unit and synchronization to the grid on June 1993. The circulating water intake structure (common to both units) was dredged to remove river debris and silt accumulation and the displaced debris was removed from the trash racks of both Units.

The circulating water trash rack rake will be overhauled or replaced as part of the Salem Revitalization effort in 1994.

The practice of using divers to clean CWS trash racks with large debris accumulations with either unit at full power will be evaluated to identify methodology in order to help reduce risks associated with this type activity.

Administrative controls (procedure, training, operator aids, etc.) will be developed and implemented as appropriate to address operation of the circulating and service water trash racks' rakes.

Corrective actions are being implemented, as discussed in prior LERs (e.g., 272/93-004-00), to address the T sub avg reduction concerns.

Implementation of the preventive and corrective maintenance programs for service water and circulating water trash racks and rakes to restore and maintain acceptable materiel condition will be evaluated.

General Manager -
Salem Operations

MJPJ:pc

SORC Mtg. 93-062

Figure Attachment 1 "Bathymetric Profiles in Front of the Circulating Water Intakes, 18 June 1993" omitted.

Figure Attachment 2 "Circulating Water Intake Cross Section" omitted.

ATTACHMENT 1 TO 9307150058 PAGE 1 OF 1

PSE&G

Public Service Electric and Gas Company
P.O. Box 236 Hancocks Bridge, New Jersey 08038

Salem Generating Station

July 8, 1993

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-70
DOCKET NO. 50-272
UNIT NO. 1

LICENSEE EVENT REPORT 93-011-00

This Licensee Event Report is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR 50.73 (a) (2) (iv). This report is required to be issued within/ thirty (30) days of event discovery.

Sincerely yours,

C. A Vondra
General Manager -
Salem Operations

MJP:pc

Distribution

The power is in your hands

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